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Dated 17 March 2005

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(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road  
Newport  
Gwent NP9 1RH

## 1. Your reference

2277/II

## 2. Patent application number

(The Patent Office will fill in this part)

0410457.6 ✓

11 MAY 2004

## 3. Full name, address and postcode of the or of each applicant (underline all surnames)

Britax Romer Kindersicherheit GmbH  
Blaubeurer Strasse 71  
89077 Ulm

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

GERMANY

6270003002

DE

## 4. Title of the invention

Strap Tension Indication

## 5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

NIGEL BROOKS CPA  
HILL HAMPTON  
EAST MEON  
PETERSFIELD  
HAMPSHIRE GU32 1QN

Patents ADP number (if you know it)

463001 ✓

## 6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country	Priority application number (if you know it)	Date of filing (day / month / year)
GB	NA	NA
	NA	NA
	NA	NA

## 7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
(day / month / year)

## 8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

a) any applicant named in part 3 is not an inventor, or  
b) there is an inventor who is not named as an applicant, or

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yes

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Description	5
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Request for substantive examination (Patents Form 10/77)	0
Any other documents (please specify)	

11. I/We request the grant of a patent on the basis of this application.

Signature

Date

11/05/04

12. Name and daytime telephone number of person to contact in the United Kingdom

NIGEL BROOKS CPA (01730) 823647

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### STRAP TENSION INDICATION

The present invention relates to a device for indicating strap tension.

5 In an automotive child restraint system, typically a child seat attached to the seat of a car, there is a requirement to tension the straps holding the child into the seat and/or the strap(s) tethering the seat in the vehicle. For the former straps, normally this is done by drawing out a central strap, which is attached to and tensions the individual straps, particularly the shoulder straps. In the latter case, tensioning is  
10 likely to be by tightening of the strap with a conventional strap adjuster.

Conventional tensioning arrangements have no means by which the user can gauge the tension in the straps, aside from feeling them.

15 In this specification, the term "tension indicator" is used to mean a device to indicate absence of slack.

The object of the present invention is to provide an indicator for indicating tension in a restraint strap.

20

In our earlier application No. 0405550.5, we described our invention of a tension indicator in combination with a strap whose tension is to be indicated, the combination comprising:

- the strap;
- 25 • a length of resilient material attached at two points along the length of the strap, the points of attachment being further apart in the longitudinal direction of the strap than the free, non-tensioned, length of the resilient material;
- a sleeve attached to the strap with the resilient material being accommodated within the sleeve; the sleeve being of a length to cover the resilient material  
30 when it is not tensioned,

the arrangement being such that on tensioning of the strap, the resilient material is drawn from the sleeve and being exposed to view indicates that the strap is tensioned.

The sleeve can be attached to the strap remote from the end of the resilient material. For instance, the resilient material may be attached to the strap via the sleeve. The sleeve can be provided at either end of the resilient material, or indeed at both ends. If it is attached at one end, it will expose the resilient material at the other  
5 end. If it is attached at both ends, the exposure is in the middle.

The resilient material may be self coloured, or it may be provided with gradations of colour or indeed a marker, to indicate the degree of tension in the strap according to the extent of exposure.

10

The inventive concept of the earlier invention can be stated more broadly and according to the present invention there is provided a tension indicator in combination with a strap whose tension is to be indicated, the combination comprising:

- the strap and
- 15 • a tension indicator, the tension indicator comprising:
  - a resilient member attached at its ends to two points along the length of the strap, the points of attachment being further apart in the longitudinal direction of the strap than the free, non-tensioned, length of the resilient member between its ends, whereby when the strap is slack the resilient member draws a bight in it between the attachment points and
  - 20 • means for visually indicating elongation of the resilient member when the strap and the resilient member are stretched in tension, whereby absence of slack in the strap can be noted.

25 It should be understood that by the "ends" of the resilient member is intended not necessarily its terminal ends, but its effective ends in that they represent the points of attachment and transfer of tensile force to the resilient member in use. For instance where the resilient member is a length of elastomeric belt stitched to the strap, vestigial pieces between the stitching and the terminal ends perform no part in the  
30 stretching of the resilient member to indicate tension in the strap.

Usually the resilient member and the visual indicating means will be respective inner and outer members, i.e. in the tension indicator

## EITHER:

- the resilient member is an inner member and
- the indicating means is
  - an outer member attached at its ends to the ends of the resilient member and encasing the resilient inner member, the outer member being provided with
  - at least one opening arranged to open on stretching of the outer member to expose the inner resilient member to view;

## OR

- the resilient member is an outer member having a central void and
- the indicating means includes
  - at least one opening in the resilient outer member and arranged to open on stretching of the outer member and
  - an inner member provided in the void inside the resilient outer member, the inner member being visible through the or each opening when the outer member is in its stretched state.

In the first alternative, the outer and the inner members stretch, having their ends attached to each other and the strap. In the second alternative, the inner member also may have its ends attached to the ends of the outer member. However, the inner member can be an inextensible member attached at one of its ends to one of the ends of the outer member. Again, it is possible for the inner member to be captivated within the outer member without need for other attachment.

Thus in a first embodiment, the resilient member can be a length of resilient material within an indicating sleeve, which latter opens on stretching to expose the resilient member. In a second embodiment, the resilient member is outermost and opens to expose an indicating member inside it. The resilient member can be a coil spring, attached to the strap as by end eyes, and the indicating member can be a peg or rod within the spring. The peg or rod can be free to move inside the spring or it may be attached on one of the attachment eyes for instance. Normally, the spring will be of the type which is coil bound when under no tension, thereby obscuring the indicating member until tensioned sufficiently to open the coils of the spring. It can

be envisaged that both the inner and outer members may be resilient, with the outer opening and the inner extending to remain continuous at all points where the outer member opens.

5 To help understanding of the invention, two specific embodiments thereof will now be described by way of example and with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a tension indicator and a strap in accordance with the invention in a relaxed state;

10 Figure 2 is a similar view of the indicator in a tensioned state;

Figure 3 is a view similar to Figure 1 of a second tension indicator and strap of the invention; and

Figure 4 is a view similar to Figure 2 of the second tension indicator.

15 Referring first to Figures 1 & 2 of the drawings, a webbing strap 1 of the type used in a safety harness, e.g. for strapping a child into a safety seat or for tethering a safety seat in a vehicle, has a piece of elastomeric belt 2 stitched 3 to it at two points along its length. The position of the two stitchings along the length of the strap is such that in the relaxed state of the strap, with not tension in either the strap or the  
20 belt, the latter draws a bight or belly 4 into the strap.

A length 5,6 of sleeving is stitched into the same points 3. The elastomeric belt is threaded within the lengths of sleeving. These are of equal length and jointly extend for the full length of the elastomeric belt in its relaxed state. The sleeving  
25 being of a type which does not readily crumple, such as filled and calendered non-woven material, it completely encloses the elastomeric belt when relaxed as shown in Figure 1.

When the elastomeric belt is tensioned, it opens at the joint between the two  
30 lengths 5,6 and stretches to a length greater than the sleeving. Thus it becomes exposed to view between the lengths of sleeving, as shown in Figure 2. The extent of stretching of the belt is limited by the distance along the strap between the stitching. Once the strap is straightened, the belt will stretch no more.

The actual tension in the strap, when the belt is fully stretched will be that in belt or more if the strap is carrying tension in parallel to the belt.

The length of the belt and the separation in the strap of the stitching will be  
5 chosen to ensure that the belt is fully stretched when the tension has reached the desired level.

This desired level can be indicated simply by the belt being exposed and the belly being pulled out of the strap.

10

Alternatively, belt can be coloured, whereby the exposed portion is red R for instance when insufficient tension is present, but the length of red colour is limited whereby when the belt is fully tensioned green portions G are exposed on either side of the red portion.

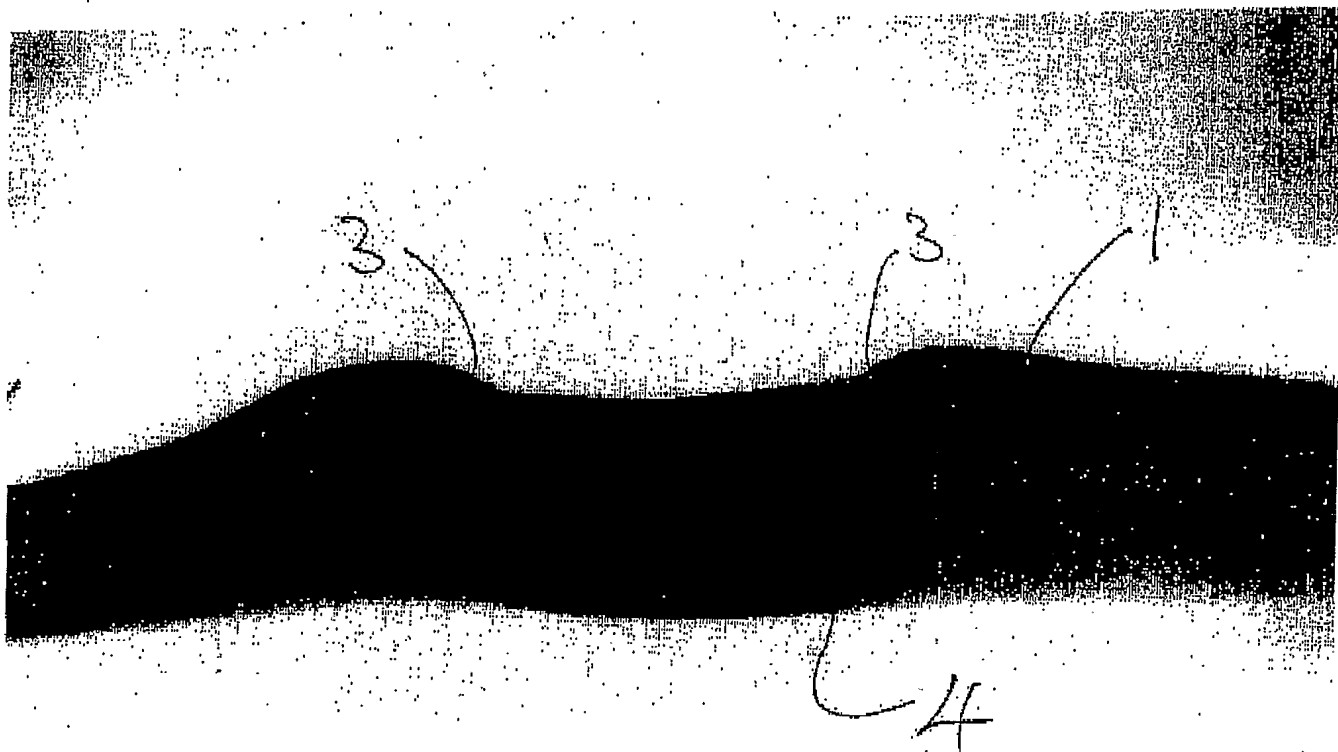
15

In another alternative, the elastomeric belt can be replaced by a piece of shock cord or indeed a coil spring as the length of resilient material or resilient member.

Referring now to Figures 3 and 4, the tension indicator there shown comprises  
20 a coil spring 11 of the type that is coil bound, as shown in Figure 3, when carrying no tension. It has eyes 12 at its ends, by which it is stitched 14 to a strap 15. Loose inside the spring, and invisible in Figure 3 when the strap is slack, a peg 16 is enclosed. When the strap is tensioned, the peg becomes visible indicating tension in the strap, in the same way as exposure of the belt indicates tensioning of the strap in  
25 Figure 2.



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7



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FIGURE 1

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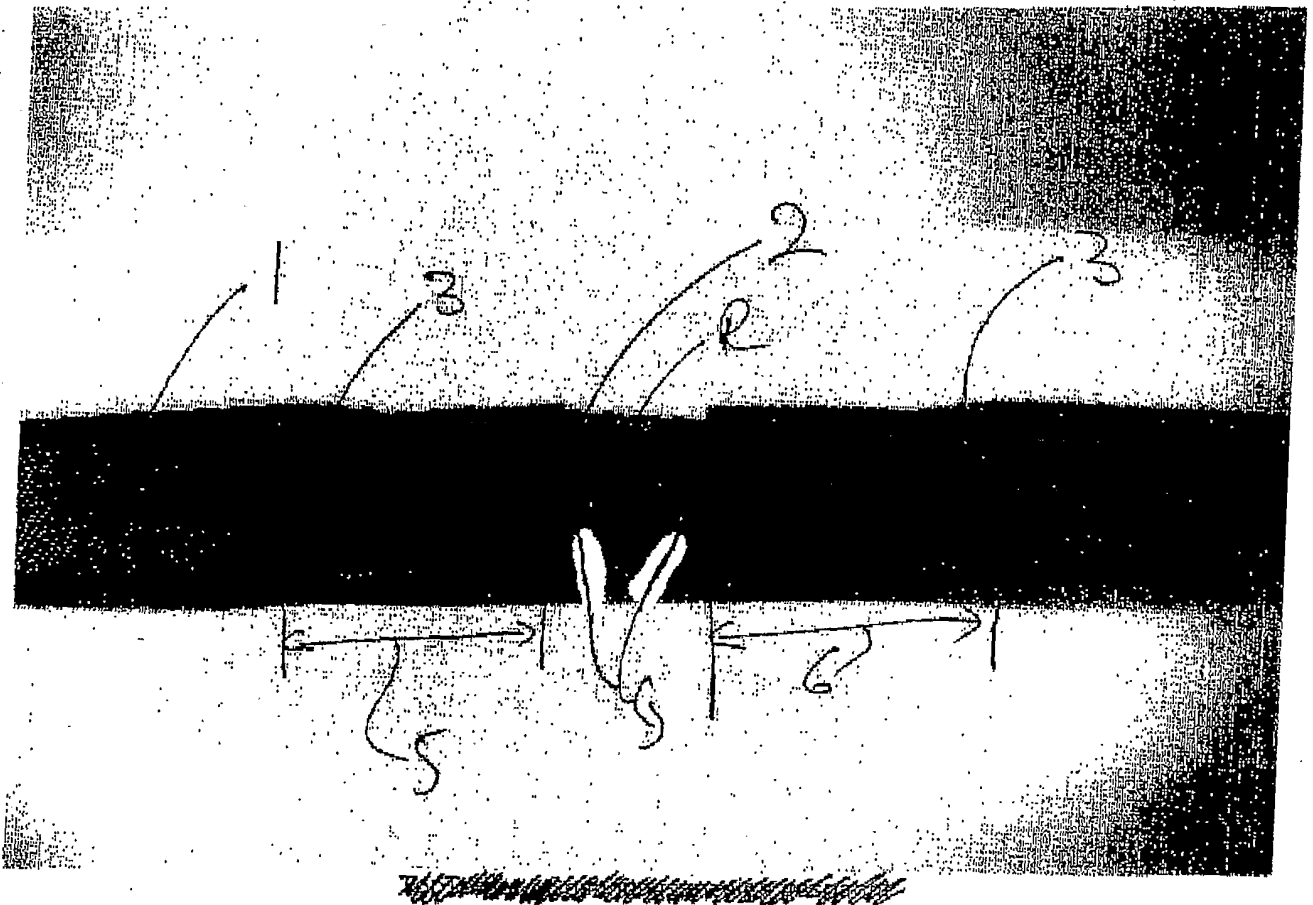


FIGURE 2

3/3

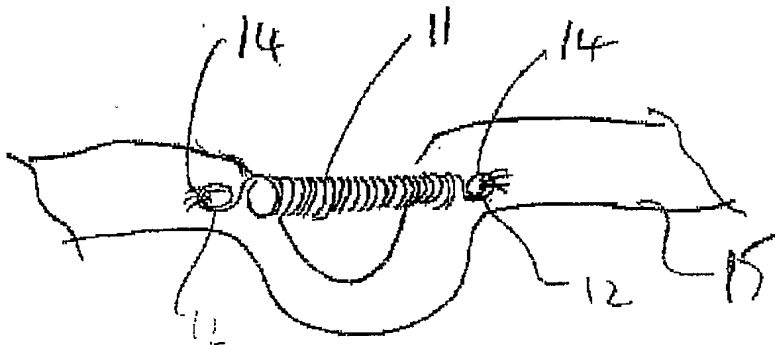


FIGURE 3

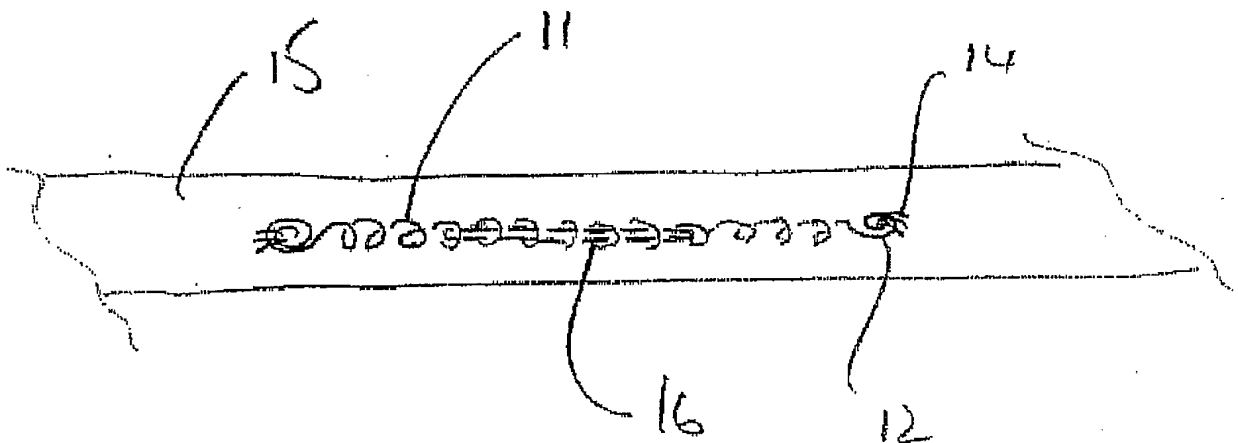


FIGURE 4